CLAIMS

What is claimed is:

1. A system for identifying pixels inside a graphics primitive of a raster image comprising:

a memory for storing a raster image; and

a graphics engine coupled to the memory and including a pipeline structure, the pipeline structure receiving information related to polygonal portions of the raster image from the memory and information related to graphics primitives from a source for determining whether a polygonal portion of the raster image is at least partly inside the graphics primitive.

2. The system of claim 1 wherein the pipeline structure further comprises a predetermined number of sequential logic circuits and a predetermined number of parallel logic circuits.

3. The system of claim 1 wherein the pipeline structure divides the polygonal portion into a predetermined number of polygonal subportions if the polygonal portion is at least partly inside the graphics primitive.

4. The system of claim 1 wherein the pipeline structure determines whether the polygonal portion of the raster image is at least partly inside the graphics primitive by evaluation of edge functions of the graphic primitive.

5. The system of claim 4 wherein each edge function of the graphics primitive is based on a general edge function, $e(x, y) = e_0 + n_x x + n_y y$ where e_0 is a constant, n_x is the x-component of a normal vector $\underline{n}$ which is normal to an edge of the primitive and n_y is the y-component of the normal vector $\underline{n}$.

6. The system of claim 4 wherein the edge function is evaluated at a corner vertex of the polygonal portion, the corner vertex being farthest in a positive direction from a primitive edge associated with the edge function.

7. The system of claim 2 wherein the pipeline structure is configured such that the sequential logic circuits are coupled together in series followed by the parallel logic circuits coupled together in parallel.

8. The system of claim 2 wherein the pipeline structure comprises seven sequential logic circuits connect in series and seven parallel logic circuits coupled together in a multi-stage pyramid structure.

9. The system of claim 3 wherein the pipeline structure determines the two polygonal subportions by determining midpoint values of two opposite sides of the polygonal portion of the raster image and using the midpoint values as vertices of the two polygonal subportions.

10. The system of claim 1 wherein the pipeline structure further comprises a predetermined number of pixel engines for determining attribute values associated with each pixel.

11. The system of claim 1 wherein the polygonal portion of a raster image has a width ΔX and a height ΔY, each of the width ΔX and the height ΔY having a value of 2^m.

12. A method of identifying pixels inside a graphics primitive of a raster image, comprising the steps of:

(a) determining whether a polygonal portion of the raster image is at least partly inside the graphics primitive;

(b) dividing the polygonal portion of the raster image into a predetermined number of polygonal subportions if the polygonal portion of the raster image is at least partly inside the graphics primitive;

(c) determining whether each polygonal subportion of the raster image is at least partly inside the graphics primitive; and

(d) further dividing the polygonal subportion into a predetermined number of polygonal subportions if the polygonal subportion is at least partly inside the graphics primitive and is larger than a pixel.

13. The method of claim 12 further comprising the step of recursively performing (c) and (d) until there are no more polygonal subportions that are at least partly inside the graphics primitive.

14. The method of claim 12, wherein the determining step (a) further comprises the step of receiving a plurality of values for corner vertices of the polygonal portion and arithmetic edge functions related to the graphic primitive having a coordinate reference frame located at a geometric center of the polygonal portion, the arithmetic edge function corresponding to an edge of the graphics primitive.

15. The method of claim 14, wherein the determining step (a) further comprises the step of evaluating an arithmetic edge function received at a corner vertex of the polygonal portion, the corner vertex being farthest in a positive direction relative to the corresponding edge of the graphics primitive.

16. The method of claim 15 wherein the polygonal portion is at least partly inside the graphics primitive if all arithmetic edge functions evaluated are positive.

17. The method of claim 12 wherein the dividing step (b) further comprises the step dividing the polygonal portion into two polygonal subportions by determining midpoint values of two opposite sides of the polygonal portion.

18. The method of claim 12 wherein the dividing step (b) further comprises the step of sequentially deriving two new sets of arithmetic edge functions associated with a translated coordinate reference frame located at a geometric center of a corresponding one of the polygonal subportions.

19. The method of claim 12 wherein the dividing step (b) further comprises the step of sequentially outputting multiple sets of information, wherein each set of information includes corner vertices of one of the created polygonal subportions and a corresponding new set of derived arithmetic edge functions.

20. An electronically-readable medium having embodied thereon a program, the program being executable by a machine to perform method steps for identifying pixels inside graphics primitives of a raster image, the method steps comprising:

(a) determining whether a polygonal portion of the raster image is at least partly inside the graphics primitive;

(b) dividing the polygonal portion into a predetermined number of polygonal subportions if the polygonal portion is at least partly inside the graphics primitive;

(c) determining whether the polygonal subportion is at least partly inside the graphics primitive for each polygonal subportion; and

(d) dividing the polygonal subportion into a predetermined number of polygonal subportions if the polygonal subportion is at least partly inside the graphics primitive and the polygonal subportion is larger than a pixel,.

21. The electronically-readable medium of claim 20 further comprising the step of recursively performing steps (c) and (d) for each polygonal subportion larger than a pixel that is at least partly inside the graphics primitive.

22. A method of identifying pixels inside a graphics primitive of a raster image comprising the steps of:

selecting a tile including a pixel;

determining if a portion of the tile is within the graphics primitive;

dividing the tile into subtiles if a portion of the tile is within the graphics primitive; and

recursively dividing each subtile having a portion within the graphics primitive until the subtile is equal in size to a pixel.

23. The method of claim 22 further comprising the step of disregarding the tile or subtile from subsequent decomposition if the tile or subtile is outside of the graphics primitive.

24. The method of claim 22 wherein the step of determining further comprises evaluating the tile at a corner vertex which is farthest in a positive direction relative to a current edge of the graphics primitive.

25. The method of claim 22 wherein the step of recursively dividing further comprises determining if the subtile is at least partly within the graphics primitive by evaluating the subtile at a corner vertex which is farthest in a positive direction relative to a current edge of the graphics primitive.

26. An electronically-readable medium having embodied thereon a program, the program being executable by a machine to perform method steps for identifying pixels inside graphics primitives of a raster image, the method steps comprising:

selecting a tile including pixels;

determining if a portion of the tile is within the graphics primitive;

dividing the tile into subtiles if a portion of the tile is within the graphics primitive; and

recursively dividing each subtile having a portion within the graphics primitive until the subtile is equal in size to a pixel.